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مجلة النماء للعلوم و التكنولوجيا

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مجلة علمية محكمة سنوية تصدر عن
كلية الزراعة جامعة الزيتونة

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مجلة علمية محكمة تصدر عن كلية الزراعة جامعة الزيتونة

تنويه

1. المجلة ترحب بما يصل إليها من أبحاث وعلى استعداد لنشرها بعد التحكيم.
2. المجلة تحترم آراء المحكمين وتعمل بمقتضاها.
3. كافة الآراء والأفكار المنشورة تعبر عن آراء أصحابها فقط.
4. يتحمل الباحث مسؤولية الأمانة العلمية وهو المسؤول عما ينشر عنه.
5. البحوث المقدمة للنشر لا ترد لأصحابها سواءً نشرت أو لم تنشر.

مجلة النماء للعلوم والتكنولوجيا

السنة الرابعة العدد الرابع المجلد (1) مارس 2023

مجلة علمية محكمة - تصدر دورية سنوية - عن كلية الزراعة جامعة الزيتونة

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مجلة النماء للعلوم والتكنولوجيا: مجلة علمية دورية محكمة تصدر عن كلية الزراعة جامعة الزيتونة تعنى بالبحوث والدراسات المبتكرة في مختلف العلوم التطبيقية وتقبل نشر الأبحاث العلمية الأصيلة والنتائج العلمية المبتكرة.

الرسالة

الاسهام في نشر العلوم والمعارف الحديثة باستخدام أحدث معايير وتقنيات النشر والطباعة، ودعم الإبداع الفكري والتوظيف الأمثل للتقنية والشراكة المحلية والعالمية الفاعلة.

الرؤيـة

الارتقاء بإصدارات المجلة لتصبح مصادر معرفة ذات قيمة علمية تفيد المجتمع، والريادة العالمية والتميز في نشر البحوث العلمية.

الأهداف

1- تحقيق تقدم في التصنيفات العالمية عن طريق تقوية الجامعة بأكملها، والتميز بحثياً وتعليمياً في كافة المجالات.

2- استقطاب وتطوير أعضاء هيئة تحكيم واستشاريين متميزون.

3- تحقيق الجودة المطلوبة للبحث العلمي.

4- تمكين الباحثين والمحكمين من اكتساب المهارات الفكرية والمهنية أثناء حياتهم البحثية والعلمية.

5- بناء جسور التواصل داخل الجامعة وخارجها مع الجامعات الأخرى المحلية والإقليمية والعالمية.

قواعد النشر

تصدر المجلة وفق مبادئ الدين الإسلامي الحنيف، ووفق قوانين الإصدار للدولة الليبية، وكذلك وفق رؤية ورسالة وأهداف جامعة الزيتونة.

قواعد و شروط النشر بمجلة النماء للعلوم و التكنولوجيا كلية الزراعة جامعة الزيتونة

1- أن يكون البحث لم يسبق نشره في أي جهة أخرى وأن يتعهد الباحث كتابة بذلك.

2- أن يكون البحث مكتوباً بلغة سليمة، ومراعياً لقواعد الضبط ودقة الرسوم والأشكال إن وجدت، ومطبوعاً بخط (Simplified Arabic) للغة العربية، وبخط (Times News Roman) للغة الأجنبية، وبحجم (12)، وبمسافة مفردة بين الأسطر، وأن تكون أبعاد الهوامش للصفحة من أعلى وأسفل (4 سم) ومن الجانبين (3 سم)، وألا يزيد البحث عن (25) صفحة.

3- أن تكون الجداول والأشكال مدرجة في أماكنها الصحيحة، وأن تشمل العناوين والبيانات الايضاحية الضرورية، ويراعى ألا تتجاوز أبعاد الأشكال و الجداول حجم حيز الكتابة في صفحة Microsoft Word.

4- أن يكون البحث ملتزماً بدقة التوثيق، وحسن استخدام المراجع، وأن يراعى اتباع نظام (APA) في توثيق المراجع داخل النص وفي كتابة المراجع نهاية البحث.

5- تحتفظ المجلة بحقها في اخراج البحث وإبراز عناوينه بما يتناسب واسلوبها في النشر.

6- تنشر المجلة البحوث المكتوبة باللغة الأجنبية شريطة أن ترفق بملخص باللغة العربية لا يتجاوز 250 كلمة.

7- ترسل نسخة من البحث مطبوعة على ورق حجم (A4) إلى مقر المجلة، أو نسخة إلكترونية إلى البريد الالكتروني للمجلة (annamaa@azu.edu.ly)، على أن يكتب على صفحة الغلاف: اسم الباحث ثلاثي، مكان عمله، تخصصه، رقم الهاتف والبريد الإلكتروني.

8- يتم تبليغ الباحث بقرار قبول البحث أو رفضه خلال مدة أقصاها ستون يوماً من تاريخ استلام البحث، وفي حالة الرفض فالمجلة غير ملزمة بذكر أسباب عدم القبول.

9- في حالة ورود ملاحظات وتعديلات على البحث من المحكم يتم ارسالها للباحث لإجراء التعديلات المطلوبة وعليه الالتزام بها، على أن يعاد إرسالها للمجلة خلال فترة أقصاها خمسة عشر يوماً.

10- أن يلتزم الباحث بعدم إرسال بحثه لأية جهة أخرى للنشر حتى يتم اخطاره برد المجلة.

11- دفع الرسوم المخصصة للتحكيم العلمي وللمراجعة اللغوية والنشر، إن وجدت.

كلمة افتتاحية

الحمد لله حمداً كثيراً طيباً مباركاً فيه، والصلاة والسلام على محمد وعلى آله وصحبه أجمعين.

يسعد أسرة مجلة النماء للعلوم والتكنولوجيا أن تقدم للباحثين أصدق التحيات وأعطرها بعد إصدارها بشكل منتظم وردود الفعل التي تلقيناها والتي كانت لنا بمثابة دافع لمواصلة السير قدماً، لتطوير بيت الخبرة، لكي يكون استمراراً للجهود المبذولة وتوثيق النتاج العلمي الأكاديمي المتخصص، رغبة من هيئة التحرير في أن تكون المجلة منفذاً لنشر الإنتاج العلمي الذي سيقدم في المجالس العلمية، ولجان الترقية، وفقاً للقواعد والضوابط المنصوص عليها.

فمن خلال العدد **الرابع المجلد الأول مارس 2023م** نهديكم أعزاءنا القراء والبحاث عدداً من البحوث والدراسات في مجالات متنوعة والتي تشكل حلقة مهمة في السلسلة البحثية لتعميق المعرفة لديكم ودعم مصادركم.

وفي الختام نتقدم بالشكر والامتنان إلى كل من ساهم وعمل على استمرار هذه المجلة العلمية، وندعو جميع الباحثين المهتمين بالعلوم والتكنولوجيا إلى تقديم نتاجهم العلمي للنشر فيها.

أسرة المجلة

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المحتويات

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المحتويات

Evaluation of the Antioxidant Activities To Various Solvent Extracts From *Asphodelus microcarpus L.* plant Growing in Al-Jabal Al- Khadar region, Libya

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تقييم نشاط مضادات الأكسدة لعدة مستخلصات من نبات العنصل النامي في منطقة الجبل الأخضر

ثريا صالح فرج
كلية العلوم، جامعة درنة، درنة، ليبيا

الملخص:

أظهرت نتائج الدراسة أن مستخلص الإيثانول من الدرنات يحتوي على أعلى كمية من القلويات والفلافونويد والفينول (++) مقارنة مع الأصناف الأخرى المستخلصة ومستخلص الإيثانول من الأوراق. أظهر التركيب الكيميائي للدرنات من Asphodelus microcarpus أعلى كمية من البروتين الكلي (12.5٪) والدهون الكلية (9.5٪) مقارنة بالأوراق. جميع الأصناف قيد البحث (الدرنات والأوراق) احتوت على الفركتوز والجلوكوز والسكروز وكانت مقاديرها (8.77٪ ، 16.58٪ ، 8.90٪) (1.40٪ ، 3.21٪ ، 3.01٪) بالنسبة للدرنات والأوراق على التوالي. بالنسبة للعنصر الكلي ، يبدو أن البوتاسيوم هو أعلى عنصر في جميع العينات قيد الدراسة. بالنسبة للعناصر الدقيقة ، يبدو أن النحاس والزنك هما أكثر العناصر الدقيقة الموجودة في عينة الدرنات قيد الدراسة ؛ بينما وجد الحديد والسيلينيوم بكميات معقولة والمنغنيز بكميات قليلة. أظهر GC–MS لمستخلص الإيثانول لدرنات المسحوق والأوراق المستخرجة من Asphodelus microcarpus 14 مركبًا تمثل حوالي 90.26٪ من درنة المسحوق المستخرجة من Asphodelus microcarpus. المكونات الرئيسية هي كما يلي: 1،8–ثنائي هيدروكسيثراسين (47.1)، بيتا–ثنائي هيدروكسيثراسين (18.9)، ألفا– ثنائي هيدروكسيثراسين (11.8) ، بينما أظهرت أوراق مسحوق الإيثانول المستخرجة أن المستخلص يحتوي على 17 مركبًا. أظهر مستخلص الإيثانول من الدرنات والأوراق احتواءه على نسبة عالية من الفينول ، وكمية عالية من مركبات الفلافونويد مقارنةً بالكوريستين المستخدم كمعيار. يُظهر اختبار القدرة المختزلة للإيثانول المستخرج من الدرنات والأوراق من Asphodelus microcarpus نشاطًا مختزلًا أعلى من حمض الأسكوربيك، ونتائج نشاط المسح الجذري للإيثانول المستخرج من Asphodelus microcarpus، هذه النتائج مقارنة مع حمض الأسكوربيك المعروف بمضادات الأكسدة حيث تبلغ نسبة التثبيط 82٪ عند 500 ميكروجرام / مل من فيتامين ج و 97.5٪ و 60.6٪ عند 500 ميكروجرام / مل من الدرنات والأوراق على التوالي.

الكلمات المفتاحية: *مستخلص الإيثانول، Asphodelus microcarpus، نشاط مضاد الأكسدة، عناصر كبرى.*

Abstract:

The results of the study show that, Ethanol extract from tuber contained the highest amount of Alkaloids, Flavonoid and Phenol (++) compared to that of the other extracted varieties and ethanol extract from leaves. Chemical composition of tuber from Asphodelus microcarpus showed the highest amount of total protein (12.5%), Total fats(9.5%),compared to leaves. All varieties under investigation (tuber and leaves) contained Fructose, Glucose and Sucrose, its amounts were (8.77%, 16.58%, 8.90%)

(1.40%,3.21%,3.01%) for tuber and leaves, respectively. For macro element, potassium seemed to be the highest element in all samples under investigation. For the micro elements, copper and zinc, seemed to be the most micro element found in tuber sample under investigation; whereas Iron and Selenium was found in fair amount and manganese in minor amounts. The GC-MS of ethanol extract of powder tuber and leaves extracted from Asphodelus microcarpus showed 14 compounds representing about 90.26% of the powder tuber extracted from Asphodelus microcarpus. The major components are as follows:1,8-dihydroxyanthracene (47.1), beta – dihydroxyanthracene (18.9), α – dihydroxyanthracene (11.8),while ethanol powder leaves extracted showed that the extracted contains 17 compounds. Ethanol extract from tuber and leaves showed contain high total phenolic content, and highly amount of flavonoids compounds as compared with the qurecetin which used as standard. The reducing power assay of ethanol extracted of tuber and leaves from Asphodelus microcarpus exhibit higher reducing activity than the ascorbic acid, The results of the DPPH˙ radical scavenging activity of ethanol extracted from Asphodelus microcarpus, these results compared with the well-known antioxidant ascorbic acid where the percent of the inhibition is 82% at 500 µg/ml of the vitamin C and 97.5% and 60.6% at 500 µg/ml of the tuber and leaves respectively.
Keywords: *Ethanol extract, Asphodelus microcarpus , antioxidant activity, macro element.*

Introduction:

Medicinal plants (also known as herbs, herbal medicine, pharmacologically active plants, or phytomedicinals) are the dominant agents of disease treatment in many countries. The more industrialized quarter of earth's population is also dependent on medicinal plant. Approximately 25% of the drugs available in the average American market are from plant in nature, either as purified extracts or as partially modified secondary products Omar,(2010). A remarkable increase in the use of medicinal plant products has been observed in the past decade. Due to their properties, medicinal plants are used as primary health care aid among 80 % of the world's population in the form of plant extracts or their active components (WHO, 2008). Today, herbs are still found in 40 % of prescriptions, and the interest for use of herbal remedies instead of chemical drugs is increasing because of lesser side effects. Most botanically derived drugs are in the form of purified extracts or partially synthesized analogues. Well-known examples include: atropine, digoxin, ephedrine, caffeine and cough suppressants. A number of newer drugs, notably the antineoplastic agents taxol, vincristine and vinblastine are also derived directly from plant sources. Less refined crude medicinal plant products such as chamomile, garlic, ginseng and opium are used throughout the world for a medicinal recreational purpose (Anjali and Sheetal Sosa 2016). Much attention has been focused on the protective biochemical function of naturally occurring herbal antioxidant in biological system and on the mechanisms of their action. Plant preparations containing flavonoids have been used for many centuries ago as herbal remedies for a variety of diseases and have been found to have an important role against many diseases such as allergies, arthritis and cancer (Waterman and Lockwood 2017). In the search for sources of natural antioxidants, in the last few years some medicinal plants have been extensively studied for their antioxidant activity and radical scavenging activity (Desmarchelier et al., 2016), Flavonoids and other phenolic compounds of plant origin have been reported as scavenger of Reactive oxygen species(ROS), thus, they are

viewed as promising therapeutic drugs for free radical pathologies (Lee et al., 2014). The antioxidant activity of plant origin is dependent on the type and polarity of the extracting solvent as well as on the test system and the substrate to be protected by the antioxidant (Heinonen et al., 1998; Kang and Lee, 2001). Over the years, humans have relied on nature for their basic needs, especially in health care. Although plants produce a broad range of bioactive chemical compounds via their secondary metabolism such as: flavonoids, alkaloids, tannins and phenolic compounds these compounds may elicit a long range of different effects that may be beneficial or toxic. *Asphodelus microcarpus is* known in Arabic as ": beruâg » and in English as Asphodel. Asphodelus is a genus of mainly perennial herbs, with starchy rhizomes, corms, or bulbs which grow in well-drained soils with abundant natural light. The genus was formerly placed in the lily family (Liliaceae) (Satıl and Akan, 2006) *Asphodelus microcarpus* is a perennial herb, 1 m high, its habitat is on hill slopes, wadi sides, floodplains of mountain streams, usually on alluvial soil (Khansaa, 2014). In traditional use *Asphodelus microcarpus* is used in many ways. For earache, the underground part is warmed in olive oil and three drops a day are put in the ear. For abscesses, a local application of the powder and decoction of the drug. The tubers are used to prepare an ointment for vitiligo and any kind of white spots on the skin. The extract of methanol and a decoction of the roots act against ulcers. The extract, rich in anthraquinones, is a laxative and a purgative (Khansaa , 2014). Many herbs present a variety of bioactive phytochemicals which have been reported to contain large amounts of antioxidant.(Javanmardi et al., 2013). However, the few biological studies for *microcarpus* species indicate the importance of the continuity of phytochemical studies and activities, with these species reported. The specific objectives were to the present study was to determination of the chemical composition of different parts (tuber and leaves) of *Asphodelus microcarpus* and determination the antioxidant activity of various solvent extracts using (Hexane, Ethyl acetate, Ethanol) from different parts (tuber and leaves) of *Asphodelus microcarpus*.

Materials and methods:

Plant material:

Asphodelus microcarpus were collected from Haniah in Al-Jabal Al Khadar area , Libya (in April 2018).

Chemicals:

1,1-Diphenylpicrylhydrazyl (DPPH˙) was supplied from Sigma and Merck company. Ascorbic acid, Folin-Ciocalteu reagent, ferric chloride, potassium ferricyanide, monobasic dihydrogen phosphate, dibasic monohydrogen phosphate, trichloro acetic acid, sodium carbonate, anhydrous sodium sulfate and pyrogallol were obtained from the biochemistry laboratory of the Chemistry department-Benghazi University.

Methods:

Sample preparation:

The leaves and tubers of *Asphodelus microcarpus*, were collected from Al-Jabal Al-Khadar area in Libya during April 2018.The leaves of *Asphodelus microcarpus* were dried in the laboratory and powdered in grinder.

Extraction of Samples:

The extract was obtained by macerating 30 g of the dried tuber and leaves from *Asphodelus microcarpus* in hexane , ethyl acetate and Ethanol (300 mL/L) for 48 h,

Soxhletion process was used for the extraction of the leaves and tuber. The resultant extracts were concentrated to dryness in a rotary evaporator under reduced pressure at 40 °C.

Store extracts:

The extracts samples were stored at 7°C in dark air-tight containers after drying over anhydrous sodium sulfate and filtered before injecting to GC-MS analysis. Thermo Scientific, Trace GC Ultra & ISQ Single Quadruple MS, DB-5 bonded-phase fused-silica capillary column was used in for GC/MS analysis of both samples.

Extracts analysis:

all samples extracted from *Asphodelus microcarpus* were subjected to

Qualitative detection of *Asphodelus microcarpus*(tuber and leaves):

Alkaloid test: (Harborne , 1984)

Alkaloids were detected using the following Dragendroff reagent : Several drops of reagent were added to 1 mL of extract. When an orange deposit is found, the result is positive indicating the presence of alkaloids

The Dragendroff reagent was prepared by mixing : Bismuth sub-nitrate, 1.7g , Glacial Acetic Acid, 20ml, water 80ml and 50% solution of Potassium iodide in water, 100ml. mix together and store as stock solution. 10ml of stock, 20ml Glacial Acetic Acid and make up to 100ml with water gives the working solution

Flavonoids test : (Al-Kazraji ,1991)

1 mL of Ethanolic KOH [5N] was added to 1 ml of the extract, when a yellow deposit was found, the result was positive indicating the presence of flavonoids

Tannins test : (Jawad , (1997)

1 ml of lead acetate (1%) was added to 1 ml of extract, when white precipitation is positive, indicating the presence of tannins

Phenol's test : (Gayon , 1972)

Dissolve 0.1 g of extract in 1 ml of distilled water and add 1 to 2 drops of FeCl3 (1%). When blue or green appears, the result is positive, indicating the presence of phenols

Saponin test : (Haddad, 1965)

Add 1 ml of mercury mercury chloride reagent (5%) to 1 ml of extract, when white precipitation is positive, indicating the presence of soap.

Resins test : (Shihata,1951)

Add 10 ml of ethyl alcohol CH_3CH_2OH at a concentration of 95% to 1 g dry weight of the vegetable portion and leave to boil in a water bath for 2 minutes. Filtered the solution, add to the filtration 20 ml of distilled water with acid droplets of 4% HCl acid shows turbidity in the solution

Chemical Composition of *Asphodelus microcarpus*(tuber and leaves):

Moisture, carbohydrates, lipid and protein contents were determined by

Association Official Analytical Chemists (A.O.A.C 2005) .

Sugars (glucose, fructose, sucrose, starch) were detected in tubers and leaves from *Asphodelus microcarpus* following **Lane and Eynon** method (A.O.A.C 2005). Sugar analysis was carried out using Shimadzu HPLC-Lc 10AB, detector RID-10A. Acetonitrile (80%) and water (20%) were used as mobile phase. Data acquisition was performed with the Shimadzu LC-Solution Software **(Central Laboratory Cairo University)**.

Determination of minerals:

The mineral content of the tuber and leaves from *Asphodelus microcarpus* were determined using Atomic Absorption Spectrophotometer according to the method described by A.O.A.C 2005**.**

Fatty acid profile of *Asphodelus microcarpus*:

Fatty acid concentration in the tuber and leaves obtained from *Asphodelus microcarpus* were estimated using the Gas Chromatography . Chromatography was performed with Unicam 610 Series gas chromatograph equipped with a flame-ionization detector and a 60 m × 0.25 mm i.d. column coated with a 0.25 µm film of HP-23. Split injection (split ratio 1:50) was performed, with hydrogen as carrier gas at a flow rate of 43 m s^{-1} . **(Central Laboratory Cairo University)**.

Gas chromatography/ Mass spectra.

Thermo Scientific, Trace GC Ultra & ISQ Single Quadruple MS, DB-5 bonded-phase fused-silica capillary column was used in for GC/MS analysis of all extracts of the dried tuber and leaves from *Asphodelus microcarpus*.

Antioxidant activities assays and quantitative analysis:

All of these experimental analyses have been conducted in biochemistry laboratory at Benghazi University.

Total phenolic content (TPC):

Total concentration of phenolic compound in the extracts of the dried tuber and leaves obtained from *Asphodelus microcarpus* were estimated using the colorimetric method based on Folin-Ciocalteu reagent (Adam *et al.* 2008)**.** 0.05 ml of the extracts at different concentrations "100,200,300,400,500 µg/ml" were mixed separately with 0.05 ml of Folin-Ciocalteu reagent. Then 0.5 ml of 15% sodium carbonate solution was added to the mixture and then the adjusted to 1 ml with 0.4 ml of distilled water. The reaction was allowed to stand for 10 min, after which the absorbance were recorded at 765 nm by UV-visible spectrophotometer. Quantification was done with respect to standard calibration curve of Pyrogallol the results were expressed as pyrogallol "µg/ml". Estimation of the phenolic compounds was carried out in triplicate. The results were mean values ± standard deviations.

Total flavonoids content (TFC):

Aluminum chloride colorimetric method was used for determination (Chang *et al.*, 2002). 2 ml of Different concentration "100, 200, 300, 400, 500 µg/ml "of extracts mixed with 0.1ml of 10% aluminum chloride, 0.1 ml of 1 M potassium acetate and 2.8 ml of distilled water. It remained at room temperature for 30 min; the absorbance of the reaction mixture was measured at 415 nm with a UV-visible spectrophotometer. The calibration curve was obtained by preparing different quercetin solutions in methanol at concentrations "100 to 500 µg/ml".

Reducing power assay (RPA):

The reducing power was determined according to the (Naznin and Hasan, 2009). 2ml of the extracts with different concentration "100,200,300,400,500µg/ml" was mixed with 2.5 ml phosphate buffer (0.2 M, pH 6.6) and 2.5 ml potassium ferricyanide then mixture was incubated in water bath at 50 C^{0} for 20 minutes and 2.5 ml of trichloroacetic acid was added to the mixture which was then centrifuged at 3000 rpm for 10 minutes. Finally 2.5 ml of the supernatant was mixed with 2.5 ml of distilled water and 1 ml $Fecl_3$,

substances, which have reduction potential react with potassium ferricyanide (Fe^{3+}) to form potassium ferricyanide (Fe^{2+}), which then reacts with ferric chloride to form ferric ferrous complex that has an absorption maximum at 700nm by UV-Visible spectrophotometer. Quantification was done with respect to stander calibration curve of ascorbic acid the results were expressed as ascorbic acid "µg/ml".

Potassium ferricyanide + ferric chloride $\xrightarrow{\text{antioxidant}}$ potassium ferricyanide + ferrous chloride.

DPPH free radical scavenging activity (RSA):

The antioxidant activity of the fixed and volatile oils was measured in terms of hydrogen donating or radical-scavenging ability using the stable DPPH˙ method as modified by (Park *et al*., 2006).

The reaction mixture containing 2 ml of the all extracts at different concentration"100,200,300,400,500µg/ml" and 2ml of DPPH˙ (0.2mM) was vigorously shaken and incubated in darkness at room temperature for 30 minutes. When the DPPH˙ reacted with an antioxidant compound in oil that can donate hydrogen, it was reduced and resulting decrease in absorbance at 517nm using UV-visible spectrophotometer, and the mean values were obtained from triplicate experiments. The percentage of the remaining DPPH˙ was plotted against the sample concentration. A lower value indicates greater antioxidant activity. Radical scavenging activity was expressed as percent of inhibition and was calculated using the following formula:-

%DPPH "RSA" = [Abs. of Control – Abs. of Sample / Abs. of Control] x 100

Statistical analysis of the data:

The results obtained were statistically analyzed according to the methods described. The probability "P" was deduced from table of "t" test according to the degree of freedom.

RESULTS

Qualitative detection of *Asphodelus microcarpus* (Tuber and Leaves):

Table's (1 and 2) show the qualitative detection of *Asphodelus microcarpus*(Tuber and Leaves) in some extracted from *Asphodelus microcarpus*.

Table(1) Qualitative detection of different extracted from *Asphodelus microcarpus* (Tuber).

Qualitative detection	Extract of *Asphodelus microcarpus*(tuber)		
	hexane extract	Ethyl acetate extract	Ethanol extract
Alkaloid test	-	+	++
Flavonoid's test	-	+	++
Tannins test	-	+	+
Phenol's test	-	+	++
Saponin test	+	+	+
Resins test	-	-	-

Table (2): Qualitative detection of different extracted from *Asphodelus microcarpus* (Leaves)

Qualitative detection	Extract of *Asphodelus microcarpus* (leaves)		
	hexane extract	Ethyl acetate extract	Ethanol extract
Alkaloid test	-	+	+
Flavonoid's test	-	+	+
Tannins test	-	-	+
Phenol's test	-	+	+
Saponin test	-	-	-
Resins test	-	-	-

***Asphodelus microcarpus* composition:**

Chemical composition of powder tuber and leaves from *Asphodelus microcarpus*:

Table (3): Chemical composition of tuber from *Asphodelus microcarpus* (g/100 g powder tuber) Mean ±Standard Deviation (N = 3).

Chemical composition content	g/100 g powder tuber
Total proteins	12.5 ± 0.05
Total fats	9.5 ± 0.21
Total carbohydrates	72.6 ± 3.11
Moisture	5.4 ± 0.04

Table (4): Chemical composition of leaves from *Asphodelus microcarpus* (g/100 g powder leaves) Mean ±Standard Deviation (N = 3).

Chemical composition content	g/100 g powder leaves
Total proteins	2.89 ± 0.23
Total fats	0.79 ± 0.01
Total carbohydrates	95.3 ± 2.96
Moisture	1.06 ± 0.01

Sugar content of powder tuber and leaves from *Asphodelus microcarpus*:

Table (5): Sugar content of powder tuber (g/100g powder tuber) Mean ±Standard Deviation (N = 3).

Sugar content	g/100g powder tuber
Fructose	8.77 ± 4.072
Glucose	16.58 ± 7.310
Sucrose	8.90 ± 4.440
Starch	46.20 ± 7.3
Other	19.55

Table (6): Sugar content of powder leaves (g/100g powder leaves) Mean ±Standard Deviation (N = 3).

Sugar content	g/100g powder leaves
Fructose	1.40 ± 0.032
Glucose	3.21 ± 7.310
Sucrose	3.01 ± 4.440
Cellulose	82.00 ± 7.3
Other	10.50

Mineral content of powder tuber from *Asphodelus microcarpus*:

Table (7) : Mineral composition of powder tuber (µg/g) Mean ± Standard Deviation.

Mineral	µg/g powder tuber
Phosphorus	493 ± 8.05
Calcium	602 ± 7.32
Iron	2.03 ± 0.12
Potassium	10542 ± 365
Copper	24.0 ± 3.72
Manganese	1.88 ± 0.03
Zinc	10.7 ± 1.65
Sodium	138 ± 3.20
Magnesium	636 ± 9.21
Selenium	4.03 ± 0.11

Table (8) : Mineral composition of powder leaves (µg/g) Mean ± Standard Deviation.

Mineral	µg/g powder leaves
Phosphorus	72 ± 9.20
Calcium	81 ± 4.16
Iron	0.04 ± 0.07
Potassium	2102 ±88.3
Copper	0.00± 0.00
Manganese	0.00± 0.00
Zinc	0.43± 0.01
Sodium	26 ± 2.97
Magnesium	104 ± 14.24
Selenium	0.00 ± 0.00

Fatty acid profile of powder tuber from *Asphodelus microcarpus*:

Table (9) : Fatty acid profile of powder tuber (g/100 g powder tuber).

Fatty acid	(g/100g)
Capric ($C_{10:0}$)	0.1
Lauric ($C_{12:0}$)	9.21
Myristic ($C_{14:0}$)	7.3
Palmitic ($C_{16:0}$)	13.7
Stearic ($C_{18:0}$)	10.8
Palmitoleic ($C_{16:1}$)	3.76
Oleic ($C_{18:1}$)	38.07
Linoleic ($C_{18:2}$)	17.24
Linolenic ($C_{18:3}$)	0.24

The GC-MS of Ethanol extract of powder tuber and leaves extracted from *Asphodelus microcarpus*

Figure **(1)** represents the chemical composition of the powder tuber extracted from *Asphodelus microcarpus* .As can be seen from this table 14 compounds representing about 90.26% of the powder tuber extracted from *Asphodelus microcarpus*. The major components are as follows: 1,8-dihydroxyanthracene (47.1), beta – dihydroxyanthracene (18.9),α – dihydroxyanthracene (11.8).

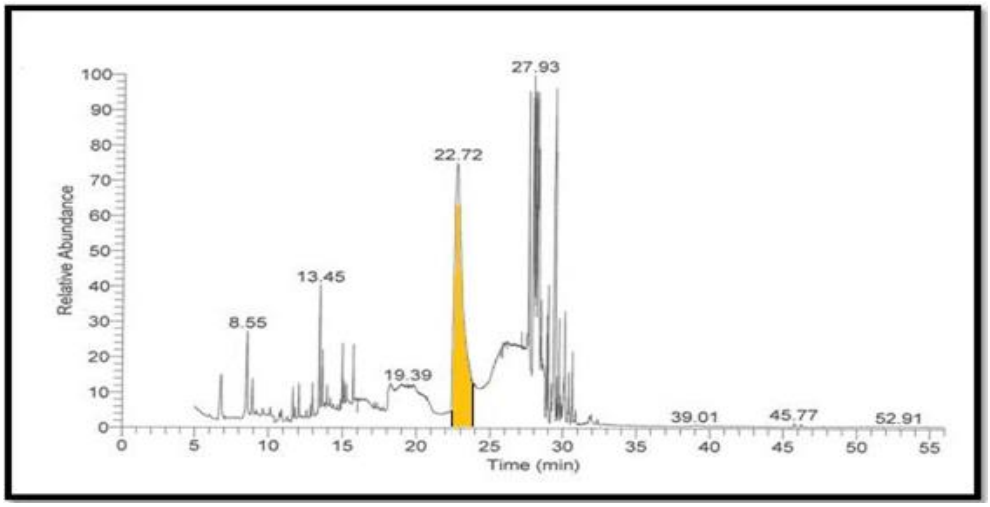

Figure (1): The chemical constituent of Ethanol extract of powder tuber from *Asphodelus microcarpus* by GC-MS.

Figure (2) shows the results obtained from the GC-MS for Ethanol extract of powder leaves from*Asphodelus microcarpus* where the results showed that the extracted contains 17 compounds. The compounds representing about 83.94% of the ethanol powder leaves extracted from Asphodelus microcarpus,one of the most important of these compounds are α–pinene (28.95), (z)-3-hexanol (11.51), Docosane (13.58), Decanal (9.05).

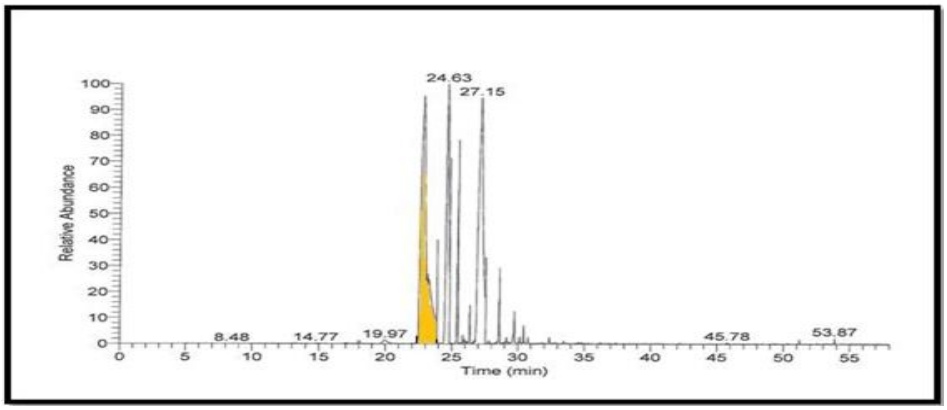

Figure (2): The chemical constituent of Ethanol extract of powder leaves from *Asphodelus microcarpus* by GC-MS.

Antioxidant evaluation of some extracts from *Asphodelus microcarpus*:

The antioxidant activities of some extracts from *Asphodelus microcarpus* are evaluated by:

Total phenolic content (TPC):

Figure's (3, 4 and 5) showed the total phenolic content that found in some extracted from *Asphodelus microcarpus*(Tuber and Leaves **)** and pyrogallol as phenolic compound where the ethanol extracted contain high total phenolic content.

Total flavonoids content (TFC):

The results obtained in this study as shown in figure's (6,7 and 8) indicate that the ethanol extracted from *Asphodelus microcarpus* (Tuber and Leaves **)** contain highly amount of flavonoids compounds as compared with the qurecetin which used as standard.

Reducing power assay (RPA):

As shown in figure's (9, 10 and 11) the reducing power assay of ethanol extracted of tuber and leaves from *Asphodelus microcarpus* exhibit higher reducing activity than the ascorbic acid.

The DPPH˙ radical scavenging activity:

The results of the DPPH˙ radical scavenging activity of ethanol extracted from *Asphodelus microcarpus* are shown in figure's (12,13 and 14), these results compared with the well-known antioxidant ascorbic acid where the percent of the inhibition is 82% at 500 µg/ml of the vitamin C and 97.5% and 60.6% at 500 µg/ml of the tuber and leaves respectively.

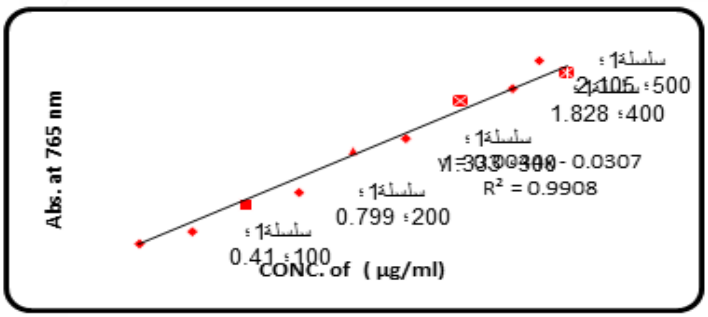

Figure (3) : Total phenolic content of pyrogallol (standard)

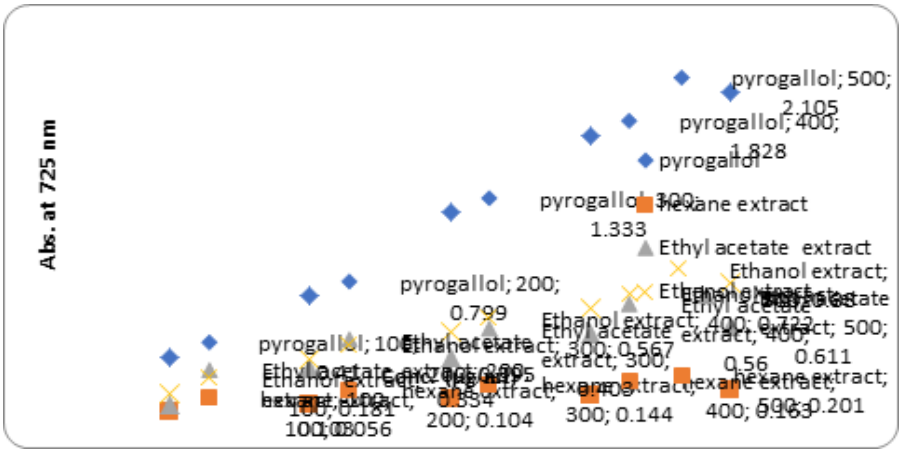

Figure (4): Total phenolic content of different extract of tuber from *Asphodelus microcarpus*.

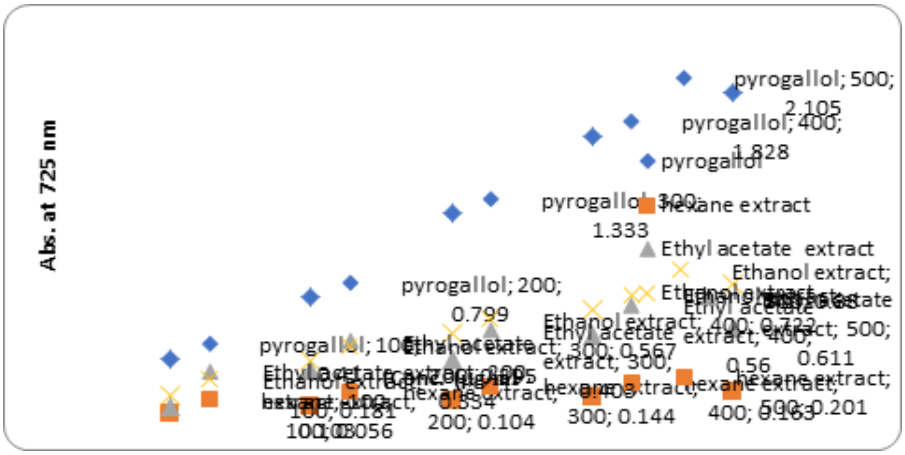

Figure (5): Total phenolic content of different extract of leaves from *Asphodelus microcarpus*.

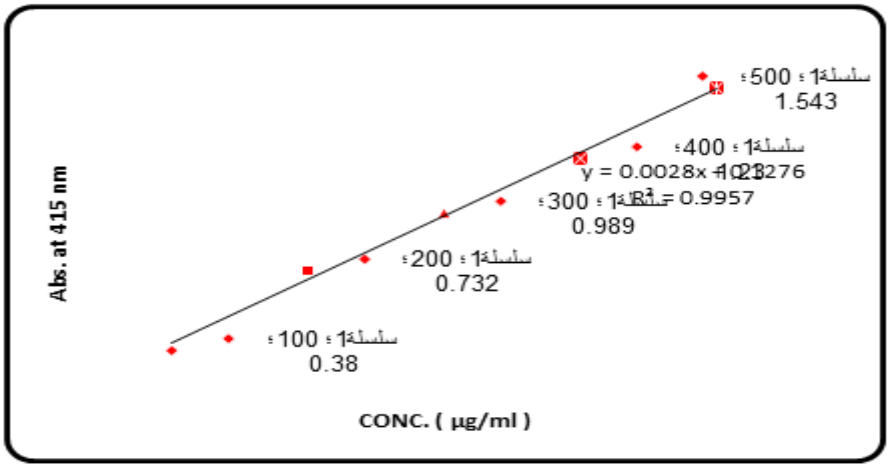

Figure (6) : Total flavonoids content of quercetin (standard)

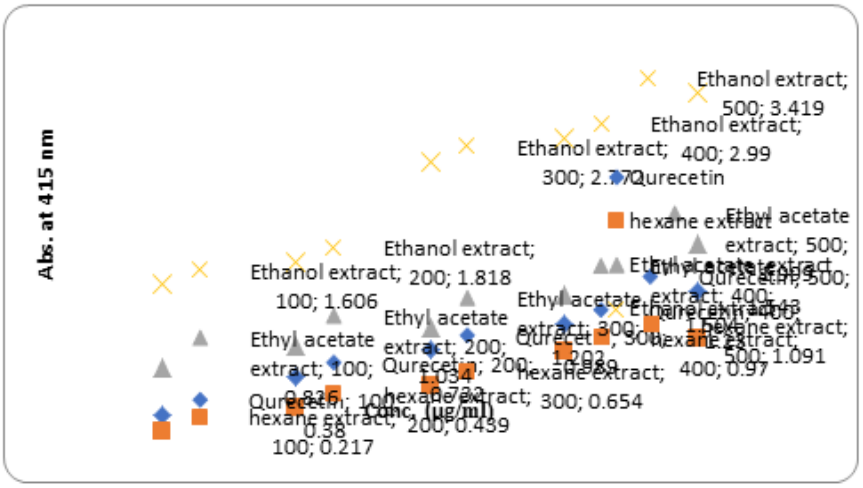

Figure (7) : Total flavonoids content of different extract of tuber from *Asphodelus microcarpus.*

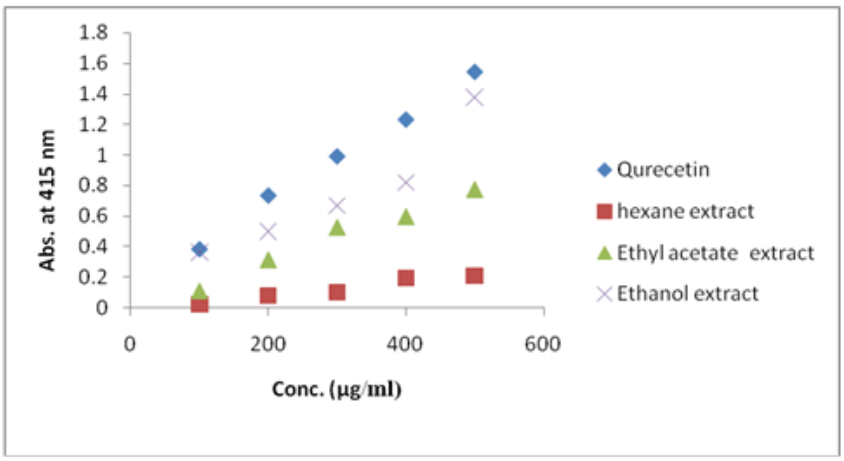

Figure (8) : Total flavonoids content of different extract of leaves from *Asphodelus microcarpus.*

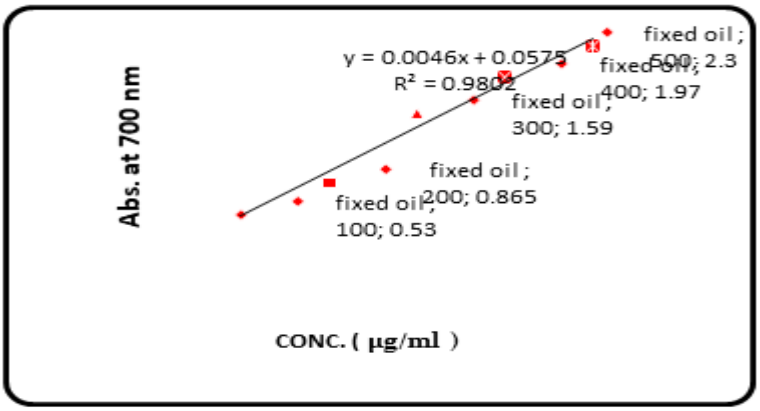

Figure (9) : Reducing power assay of ascorbic acid (standard).

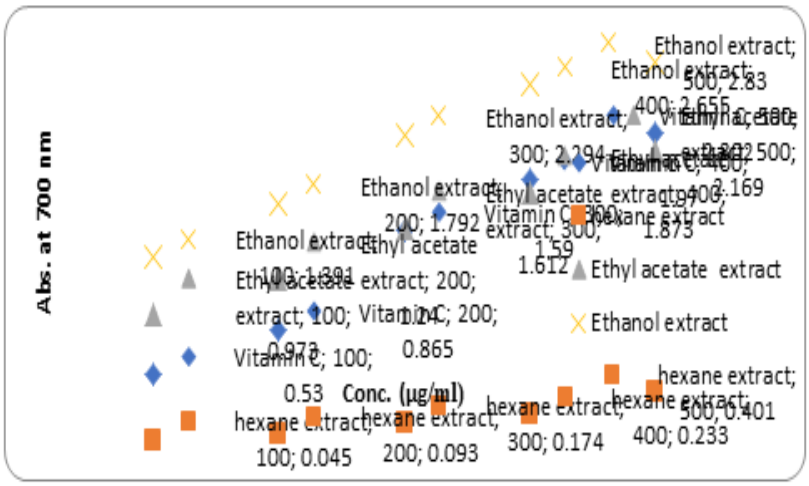

Figure (10): Reducing power assay of different extract of tuber from *Asphodelus microcarpus*.

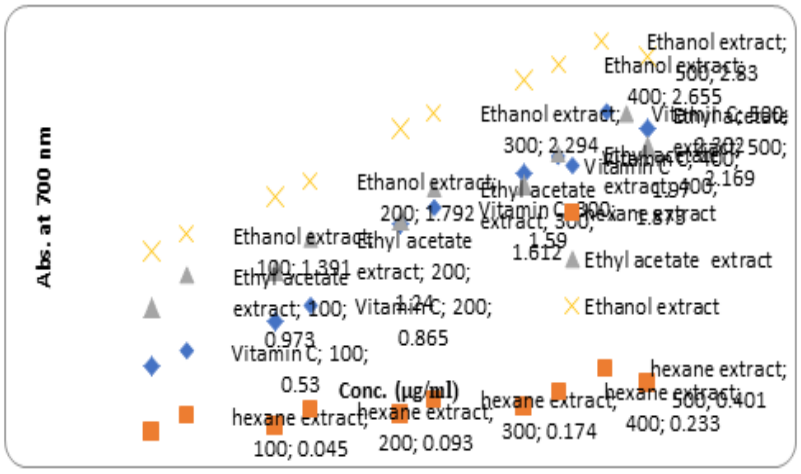

figure (11): Reducing power assay of different extract of leaves from *Asphodelus microcarpus.*

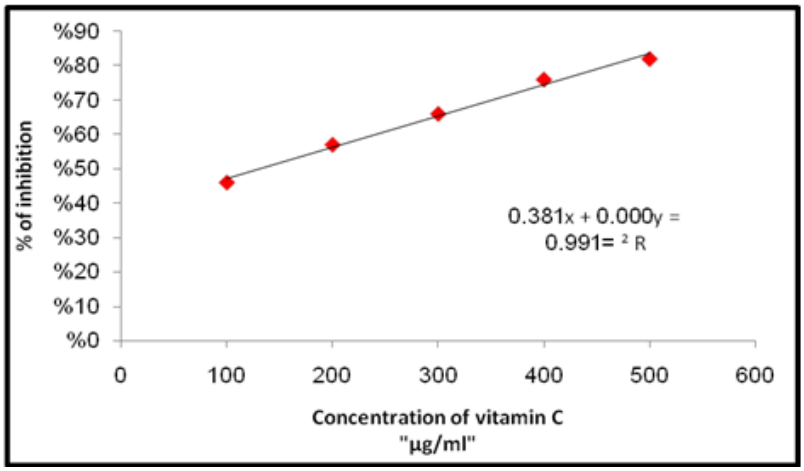

Fig (12) : DPPH radical scavenging assay of vitamin c (standard).

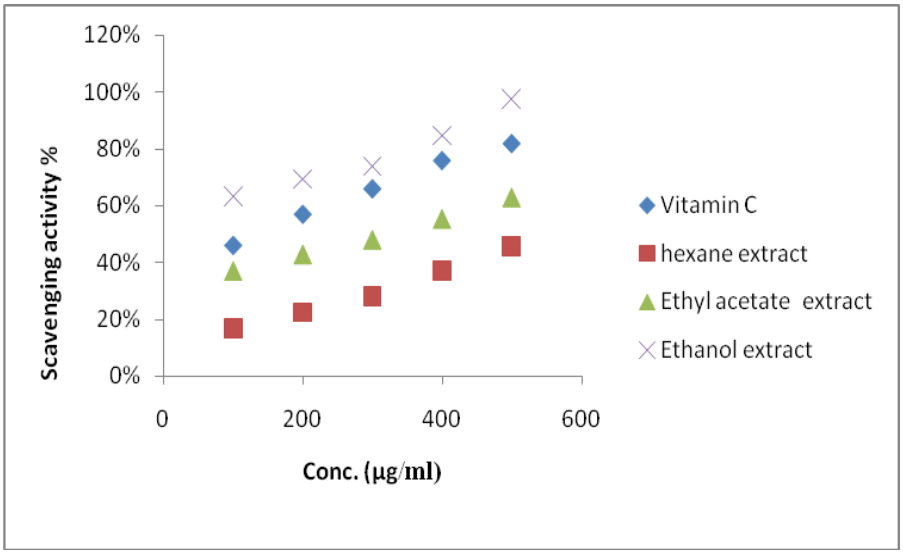

Figure (13): DPPH radical scavenging assay of different extract of tuber from *Asphodelus microcarpus* and Vitamin C.

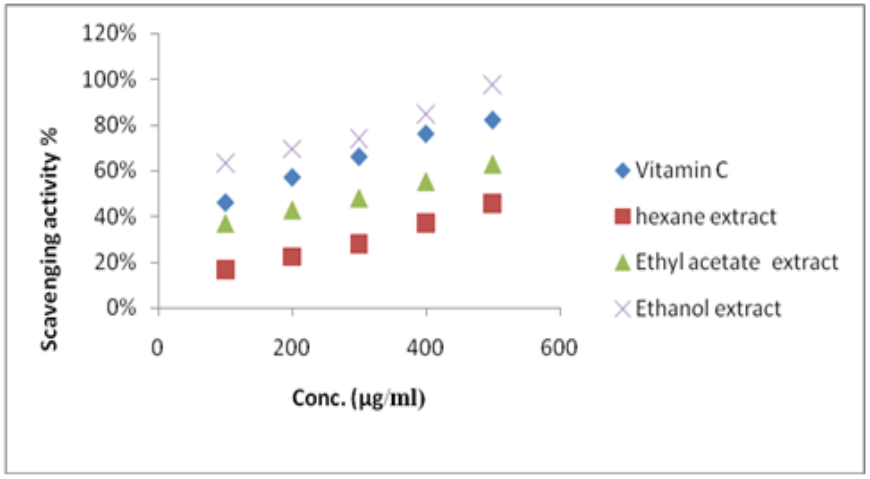

Figure (14): DPPH radical scavenging assay of different extract ofleaves from *Asphodelus microcarpus*.

Discussion:

The results obtained are going to be discussed under the following headings:

1- Antioxidant activity of *Asphodelus microcarpus* collected from Al-Jabal Al Khadar of Libya.

2- Chemical composition of test compound.

Antioxidant activity of test compound

Total Phenols and Total Flavonoids.

Total phenolic content (TPC) and total flavonoid content (TFC) of ethanol extract powder tuber and leaves from *Asphodelus microcarpus* are presented in Figure's 3, 4, 5, 6, 7 and 8 . The samples had higher significant ($P \leq 0.05$) TPC and TFC compared to the Pyrogallol and Qurecetinas standard. The beneficial effects derived from phenolic compounds have been attributed to their antioxidant activity (Heim *et al.*,2002) and studies have suggested the role of phenolic compounds as the major sources natural

antioxidants in foods of plant origin (Hagerman *et al.,* 1998).

Kang *et al.* (2012) and Simas *et al.* (2010) reported that beneficial effects derived from phenolic compound have been attributed to their antioxidant activity. They further stated that antioxidant activity of the extracts cannot be predicted only by total polyphenol content.

Antioxidant Activity:

The ability of tuber and leaves samples to scavenge DPPH radicals were determined and the results are show in Figure's 9, 10 and 11 . Because DPPH radical is very sensitive to active ingredients of low concentration and can accommodate a large number of samples in a very short time, this procedure is often used for measuring radical scavenging activity of different plant extracts (Sultana *et al.,* 2007). Referring to Figure's concentration of 500" µg/ml corresponds approximately to scavenging activities of 88% and 97.5% for ascorbic acid (Standard), for ethanol extracted of tuber from *Asphodelus microcarpus*, respectively.

Kalim *et al*. (2010) reported that DPPH scavenging capacity of plants used in Unani system of medicine cultivars ranged between 52.2% and 86.0%. In the same context, Panghal *et al*. (2011) stated that DPPH radical scavenging activity of ten medicinal plants were highly correlated with the phenolic content (r2 = 0.99).

Chemical composition of powder tuber and leaves from *Asphodelus microcarpus*

Tuber and leaves play an important part for certain plants in production of the new plant generation. Normally a tuber is composed of proteins, carbohydrates and lipids. Chemical composition of tuber and leaves samples is shown in Table's (3 and 4). Values of protein, fat, Moisture, and carbohydrates were presented in dry weight basis. Tuber of this sample contained the amount of protein (12.5%) in dry weight basis. Movahed *et al.* (2012) reported low value of protein (10.06%) for tuber from *Asphodelus microcarpus* of Iranian .

Concentrations of sugars (glucose, fructose, sucrose) were determined for the tuber and leaves samples Table's (9 and10). Concentrations of glucose and fructose in tuber sample was lower than that reported by Saleh *et al.* (2011) for these sugars in tuber from A. microcarpus Salzm, also Rimbau *et al.* (1996) reported high glucose content (22.8%) in tuber of A. microcarpus from Algeria.

The composition of minerals of tuber and leaves samples is shown in Table's (7 and 8), Na, K, Mg, Ca and P contents are high compared to other minerals for the sample. These five elements called Macro-minerals are distinguished from the micro-minerals by their occurrence in the body, as they required in amounts greater than 100 mg per day (Groff *et al.,* 2002).

K presented the highest content in the sample. Leterme *et al.* (2006) stated that K presented an average of 32% of the total mineral content of samples investigated. Cl , S and Ca come second to K in abundance in tuber from A. microcarpus Salzm samples. All the mentioned macro-minerals have vital physiological and biochemical functions in human body. The three essential micro-minerals Fe, Se and Zn are present in the sample in varying amounts. Compared to tuberof A. microcarpus from Algeria mineral composition (Saleh *et al.*,2011), only Zn and Se are found in fair amounts.

Cu content of the sample (24 µg/g) considered to be fair compared to other plant-based foods (Leterme *et al.,* 2006). She is another mineral found in the sample Table (8)

in amounts comparable to other dietary sources. The greatest biological significance of selenium in the organism is associated with its occurrence in active sites of many enzymes and proteins (Kieliszek and Blażejak, 2013).

Tuber oil (Table 9) is obtained from powder tuber through Soxhlet extraction technique. In powder tuber oil, oleic acid (C18:1) comprises over 50% of the fatty acid content and represents the main fatty acid in the oil, followed by 19% linoleic acid (C18:2), 10% lauric acid (C12:0) and 10% palmitic acid (C16:0) (Abuhamdah *et al.*, 2013). As shown in Table (9), the oleic, linoleic, lauric and palmitic acid that occurred in powder tuber oil were 38.07%, 17.24%, 9.21% and 13.7%, respectively.

Abd El-Fattah (1997) found that the oleic acid content of 4 cultivars of the tuber oil ranges from 23 to 35%, which could be a good source of C18:1 fatty acid. To conclude, the tuber oil is mainly composed of the four fatty acids namely oleic, linoleic, lauric and palmitic acid.

In comparison, it is found that the canola oil has 54% oleic acid (Marikkar *et al*., 2002). This composition is almost similar with the oleic acid content found in tuber oil reported above. Canola oil have been used in food as salad oils, and shortening for baking and frying (Hammouda *et al.*, 2016). Other than that, canola oil have been mixed with used cooking oil in order to improve biodiesel production (Issariyakul *et al*., 2008). They found that the mixtures of these canola and used cooking oils at certain ratio could also reduce the feedstock and operating cost which will result in lower total production cost of biodiesel.

Our results obtained from the in vitro antioxidant screened showed that ethanol extract of tuber and leaves samples have considerable amounts of polyphenolic and flavonoids compounds which are responsible for the antioxidant properties. And also they give the higher reductive potential due to reducing capacity and DPPH free radical scavenging activity which serves as strong indicator of antioxidant activities. Williams (1975)found that roots had the highest radical-scavenging activity.

The phenolic and the flavonoids compounds are groups of secondary metabolites with broad range of biological properties such as: antioxidant, anti-atherosclerosis, cardiovascular protection and improvement of the endothelial function, it has been reported that antioxidant activity of the phenolic compounds is mainly due to their redox properties which allow them to act as reducing agents, hydrogen donors play an important role by adsorbing and neutralizing reactive free radicals, and chelating ferric ions which catalyses lipid peroxidation, and regarded as promising therapeutic agent for free radical-linked pathologies (Nyangono*et al.*, 2012).

Ethanol extracted of powder tuber and leaves from *Asphodelus microcarpus* rich in phenolic constituent such as α-pinene, terpinolene, and1.8 dihydroxyanthracenehave the highest antioxidant activity against bacterial .

The result obtained from the GC-MS technology found that the most important components are α-pinene, terpinolene, and 1.8 dihydroxyanthracene. The high concentration of 1.8 dihydroxyanthracene in tuber sample and α-pinene in leaves sample makes it potentially useful in the medicines because they exhibit antibacterial, antifungal, anti-inflammatory activity and antioxidant properties according to Abdel-Gawad *et al.*, (2017).

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